

## PLANT FOR UNLOADING STACKS OF THERMOFORMED OBJECTS FROM A RECEIVING CAGE TO A REMOVING CONVEYER.

### 5 Background of the invention

The present invention regards a plant for unloading stacks of thermoformed products from a stack receiving cage onto a removing conveyer.

With the expression "thermoformed objects" in this description and in the claims, it is meant hollow packaging products, typically, lids and containers, e. g. drinking cups, coffee cups, dessert cups, tubs, plates, trays and the like.

Unloading and handling in general of a plurality of stacks of thermoformed objects is often problematical as the passage from one transfer support to another needs constant surveillance to ensure the perfect axial alignment of the stacks and it is necessary that the various products forming each stack are kept compact to avoid the disintegration of the stacks, which may occur for example with shallow containers, such as lids and plates, which can be a source of problems and difficulties in successive handling operations, e. g. during the de-stacking of these products, for example in an automatic de-stacking machine.

### 20 Summary of the invention

The main object of the present invention is to provide a plant for unloading or discharging a plurality of parallel stacks of thermoformed products from a containing crate or cage to another support, which makes it possible to change the orientation direction of the stacks, whilst keeping these compact and in perfect axial arrangement.

25 Another object of the present invention is that the said unloading plant or system permits the graduated and sequential discharge of a pre-established number of stacks at a time until all the stacks in a containing cage have been discharged.

Yet another object of the present invention is that the said discharge plant is of a high efficiency and can operate in step and in synchronisation with a thermoformed products stacking line downstream of a single station thermoforming machine or press with form and cut mould.

These and other objects, which will better appear below, are attained by a plant for unloading stacks of thermoformed products starting from a stack containing cage, which includes a support structure, at least one supporting plate for a respective stack containing cage, that is mounted for rotation on said support structure, drive means

arranged to cause the said support plate angular excursions of predetermined amplitude around a horizontal axis, thereby angularly moving a respective stack containing cage between an erect position, in which the stacks of thermoformed objects contained therein extend in a substantially vertical direction, and an inclined discharge position, expeller

5 means for expelling stacks of thermoformed products from said support plate when said support plate is in an inclined discharge position, and a receiving conveyer for the stacks of thermoformed products unloaded from said containing cage located downstream of the discharging position of said support plate.

Advantageously, the plant includes drive means to vertically move said support  
10 plate between a plurality of discharge positions to unload groups of stacks of thermoformed objects onto said receiving conveyer at different levels. Moreover, said receiving conveyer is inclinable substantially at the same angle of inclination as said support plate in its inclined discharge position.

15 **Brief description of the drawings**

Further aspects and advantages of the present invention will better appear in the following detailed description of some currently preferred embodiments, given as illustrative and not limiting examples with reference to accompanying drawings, in which :

Figure 1 is a front view of a plant according to the present invention, without (for  
20 illustrative purposes) a taking away conveyer;

Figure 2 shows a detail on an enlarged scale of a support plate of a receiving crate for stacks of thermoformed objects;

Figure 3 shows a complete plant according to the present invention with a taking away conveyer arranged in horizontal attitude;

25 Figure 4 shows a diagrammatic and partial front view of a handling plant according to the present invention, with expeller means acting horizontally;

Figure 5 shows a plant according to the present invention with taking away conveyer in inclined attitude and while receiving stacks of thermoformed objects; and

Figure 6 is a frontal diagrammatic view of the system of Fig. 5.

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**Description of the preferred embodiments**

With reference to the above Figures, it will be noted that as an discharge or unloading plant or system, generically indicated with 1, according to the present invention, is made up of a support structure or upright 2, which bears overhead a support plate (3) for

a receiving cage 4 of stacks 5 of thermoformed objects or products. The support plate 3 is formed with a plurality of through openings or slots 6 (Fig. 2) at each stack or row of stacks 5 and is mounted for rotation around a horizontal axis x-x on the upright 2 through a support head 7 rotatable about the axis x-x and provided with a reversible electric drive 5 motor 8 which carries out angular programmed movements of preset width. The support plate 3 and the cage 4 brought by it are therefore angularly movable between an erect position, in which the cage 4 can be loaded in any suitable way with a multiplicity of stacks 5 of vertical thermoformed products, and an inclined discharge position.

Beneath the support plate 3 there is provided a product expeller device, e. g. 10 comprising a support stand 11, and a transverse expulsion bar 12 at the head of a plurality of rods 13 driven at the other side thereof by a double-acting pneumatic jack 14 and slidably supported on the stand 11. The bar 12 is arranged to pass through the slot 6 or slots 6 in the support plate 3, once the latter has been brought into its inclined unloading position, to expel a complete row of stacks 5 of thermoformed products from the cage 4 15 and discharge them onto a taking away conveyer 20.

Should the cage have several rows of stacks 5, the turning head 7 is mounted on a slide 15 slidably mounted on vertical guides 16 and driven to move up and down, upon control, by a reversible electric motor 17 which drives a control screw 18 meshing with a nut screw integral with, or secured to, the slide 15. With this structure, once a row of stacks 20 5 has been expelled from the cage or crate 4, the plate 3 is lowered to such an extent as to bring the adjacent row and successively, the remaining rows of stacks to the level of the taking away conveyer 20.

The receiving and taking away conveyer 20 for the stacks 5 of thermoformed products unloaded by the expulsion bar 12 from the containing cage 4 is of the belt type 25 and is located downstream of the unloading position of the support plate 3 and, preferably, as better illustrated in Figures 5 and 6, it can be inclined at an angle of less than 90°, e. g. owing to the action of a couple of pneumatic jacks 22, around an articulated horizontal axis, along which there are provided linking pins 21 for articulation to an underlying support frame 23. Preferably, the inclination of the belt conveyer 20 is equal to that of the 30 supporting plate 3 when in its discharging position.

Once complete unloading of the cage 4 has taken place, the conveyer 20, preferably, takes again its horizontal attitude owing to the action of the jacks in order to be aligned with the standard position, for example of a packaging line of stacks 5.

In Figure 4, there is illustrated a taking away conveyer 20 in its horizontal attitude, which is fed with stacks 5 of thermoformed products by an expulsion bar 12 driven by rods 13 also moving in a horizontal direction..

Above and parallel to the direction of movement of the conveyer 20 there are two  
5 moving guides: one 25 at the side of the conveyer close to the plate 3 and the other 26 on the opposite side, which extends for the whole length of the conveyer, while the guide 25 terminates at the cage 4 so as not to hinder the passage of the stacks 5 as they are expelled from the cage 4. The guides 25 and 26 prevent the decomposition of the stacks 5, as shown in Fig. 4, when they are loaded on the conveyer 20. During the unloading  
10 phase, at the missing section of the guide 25, the expulsion bar 12 acts as a sliding guide, and remains in a co-planar position with the guide 25 until the tape of conveyer 20 is not sufficiently advanced so that all the stacks slidingly abut against the bar 20.

Advantageously, the guide 26 can be adjustably positioned with respect to the guide 25, e.g. by means of overhanging supports 27 and locking clamps 27a. Moreover,  
15 the conveyer belt can have transverse partitions 28, which extend parallel to and uniformly spaced from 28 to delimit receiving cradles for the stacks 5, thereby keeping them in constant axial alignment .

As can be seen in Fig. 3, the cage 4 is loaded with stacks 5 of thermoformed products by a transfer device 30, e. g. of the rotating arm type, which can raise-lower to  
20 pick up and unload (total or partial) stacks 5 of thermoformed products from a stacking station 31 located at a rotating conveyer 32, for example with four radial template-carrying arms for transporting and stacking thermoformed products.

The disclosure in Italian patent application no. VR2001A000018 filed on February 15, 2001 from which priority is claimed is incorporated herein by reference.

25 Any reference sign following technical features in any claim has been provided to increase intelligibility of the claim and shall not be construed as limiting the scope of the claim.